**Ecosystems: Terrestrial and Aquatic**

**5-2 Students will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems. (Life Science)**

**5-2.5 Explain how limiting factors (including food, water, space, and shelter) affect populations in ecosystems.**
**Taxonomy level:** 2.7-B Understand Conceptual Knowledge

**Previous/Future knowledge:** Students have previously learned about the needs of living things and the interdependence between animals and plants in their habitats (3-2), but they have not explored the concept of limiting factors. In 7th grade (7-4.3), students will explain the interactions between various environmental changes and limiting factors.

**It is essential for students to** know an ecosystem only has a certain amount food, water, space, and shelter to support a certain number of organisms.

- The relationship between numbers of organisms and the resources available in an ecosystem is often described as the *balance of nature*.
- A condition or resource that keeps a population at a certain size is known as a *limiting factor*.
- If any of the limiting factors change, animal and plant populations may also change.
- Some changes may cause a population to increase; others may cause a population to decrease.

Increases in population may result in overcrowding. Sometimes a population will grow too large for the environment to support. Some examples that may cause a population to increase may be:

- If there are more plants than usual in an area, populations of animals that eat that plants may increase.
- If the population of predators increases, the population of prey will decrease.
- If the population of prey increases, the population of predators will also increase because of the availability of food.

Other changes in limiting factors may cause a population to decrease. Some examples may be:

- If the water supply in an area decreases, the population that needs that water may decrease. Then the population of animals that eat that animal could decrease too.
- If trees are cut down, die because of disease or parasites, the population of the animals that use the trees for food or shelter will decrease.
- If organisms no longer have enough space to survive, they will either have to move or will die. This change in space may be due to human influence or natural hazards.

**It is not essential for students to** about carrying capacity or how a change in climate or how biotic factors affect population sizes.

**Assessment Guidelines:**
The objective of this indicator is to *explain* the how limiting factors affect populations in ecosystems; therefore, the primary focus of assessment should be for students to construct a cause-and-effect model that shows how populations change due to limiting factors. However, appropriate assessments should also require students to *recall* limiting factors; *summarize* ways that limiting factors influence the balance of nature in an ecosystem; or *exemplify* ways that the abiotic factors affect populations of organisms.